## Remarks

### Invention Summary and Background Remarks Relating to the Status of the Claims

Applicants disclose and claim a novel method and composition of matter for decontaminating water containing anionic contaminants, especially arsenic contaminants and chromate. The invention utilizes adsorbent compounds comprised of divalent and trivalent metal oxides and sulfides that sorb anionic contaminants through a mechanism that includes the formation of surface complexes with contaminant species.

Claims 1 – 8 were originally filed in this Application, however, following a restriction requirement, Applicants elected Group I, a process for removing anionic contaminants from water, Claims 1 – 4, without traverse. Applicants were also required to elect a species, and accordingly, Applicants elected the anionic contaminant species arsenic and the sorbent material $CuFe_2O_4$. Accordingly, claims 5 – 8 stand withdrawn from prosecution.

Under the present (final) Office Action claims 1 – 4 stand rejected as anticipated by Sivavec ('570) under 35 USC 102(a) and as anticipated by Dawson, et al. ('831) under 35 USC 102(b). In addition, the Office has cited a new reference, Sugano, et al. ('007) not previously cited during the prosecution of this application. In response to the present Office Action, Applicants present argument in support of the claims as originally filed to demonstrate their

patentability over all of the references cited in the present Action. In addition, new claims 9 – 14 are likewise discussed concerning their patentability over the cited references.

*Inherency*

In response to the previous rejections based on Sivavec and Dawson, Applicants submitted that both of those references lack Applicants' claimed element in claim 1 (likewise carried forward by virtue of dependency into claims 2 – 4) of

" . . . sorbent material that binds anionic species predominantly through the formation of surface complexes, . . ." (Applicants' claim 1, lines 3 – 4.)

Further, according to Applicants' claim 1 (lines 4 – 6),

" . . . said sorbent material comprises divalent metals, trivalent metals and species selected from the group consisting of oxygen and sulfur."

According to the Office, since both references disclose contacting a contaminated aqueous stream with a composition containing the recited " sorbent" material (i.e. magnetite), then the results obtained in each of the two cited reference processes must inherently be the same as those obtained by Applicants.

Applicants respectfully submit, however, that both the Sivavec and Dawson references reveal that removal of contaminants in those cases is *not* achieved through action of magnetite serving as the sorbent material, and therefore, there is no basis to conclude that the results obtained would inherently be the same as Applicants' results. Rather, in both references, magnetite serves different purpose than in the present invention, and the reference inventions

employ a different sorbent material than that used in Applicants' invention to remove anionic contaminants. (In Sivavec, the sorbent material is FeS, and in Dawson, the contaminant-removing material is ion exchange medium or a " sorbent medium" chosen for its affinity for the target substance.) Hence, it is neither expressly disclosed nor an inherent feature in either the Sivavec or the Dawson invention references that a " sorbent material" comprising " divalent metals, trivalent metals and species selected from the group consisting of oxygen and sulfur" serves to " bind anionic species predominantly through the formation of surface complexes" as recited in Applicants' claim 1.

Sivavec: As noted in Applicants' response to the First Office Action, magnetite has no sorbent function in the Sivavec invention, but rather it serves as a reducing agent. (See, for example, Sivavec, claim 1, which ferric ion compounds there serve to combine with non-iron sulfide to yield *ferrous sulfide reactive sites* capable of reacting with contaminants.) The sorbent material in Sivavec is FeS, not magnetite. Therefore, it does not follow from the Sivavec reference that magnetite inherently binds anionic species through formation of surface complexes because the Sivavec references teaches that it is ferrous sulfate, not magnetite, that binds contaminants.

Dawson: In the Dawson disclosure, magnetite is used as a carrier particle to move ion exchange media particles through the contaminated fluid. (See: Dawson '831 col. 5, line 67 – col. 6, line 5.) In that invention, magnetite is used only for its magnetic and mechanical properties. The contaminant-removing material in is either ion exchange medium or sorbent

medium selected because it exhibits the desired sorbent characteristics (see, e.g.: Dawson col. 2, lines 61-62). Since in Dawson, there is no disclosure or even suggestion that magnetite serves as a sorbent material in that invention or plays any role in binding anionic species (as claimed in Applicants' claim 1) it does not follow from the Dawson reference that magnetite inherently binds anionic species through formation of surface complexes.

Sugano: In support of its inherency assertion, the Office also cited Sugano, et al. ('007) for the proposition that when chromium is contacted with magnetite in an aqueous solution, this chromium will be adsorbed by the magnetite. It is respectfully submitted, however, that the Sugano does not substantiate the assertion of inherency.

Sugano discloses a method of extracting heavy metals from acid-containing waste water solution through formation of a precipitate. According to the Sugano method, ferrous ions (e.g. from a ferrous salt such as ferrous sulfite or ferrous chloride) are added to contaminated waste water. An alkaline substance (e.g. $NH_4OH$) is then added to the waste water yielding precipitates of hydroxides. The precipitates then are converted, using an oxidation process, to iron-containing compounds that include various ferromagnetic oxyhydrates and/or oxides such as magnetite.

While adsorbency of heavy metals by ferrites formed in the course of Sugano' s process is mentioned in that disclosure, there is neither any rationale nor any evidence to suggest that the Sugano invention functions through the formation of surface complexes, as recited in Applicants' claim 1. Indeed, since various ferric compound precipitates may be generated using the Sugano process (see, for example, Sugano Claim 1) it is not possible to assert based on that disclosure

exactly what mechanism is responsible for the sequestration of contaminants by precipitates in that process.

According to M.P.E.P. Sec. 2112, " the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. . . . To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill."

Returning to the elements of Applicants' claim 1, the Office has supplied no extrinsic evidence to make clear that " sorbent material compris[ing] divalent metals, trivalent metals and species selected from the group of oxygen and sulfur" (Applicants' claim 1, lines 5 - 6) " binds anionic species predominantly through the formation of surface complexes" (Applicants' claim 1, lines 3 - 4), which is missing from the references, is necessarily present in the phenomena described in them. Nor has the Office provided any evidence that persons of ordinary skill in the art would recognize this to be so. In Sivavec and Dawson, magnetite is not even considered in reference to serve as a sorbent material, and in Sugano, although sorbency by magnetite is mentioned, it is but one of several possible reasons that the precipitate in that invention sequestered contaminants. None of the cited references, however, teaches or even suggests that anionic species are bound in a fashion that would yield surface complexes.

Therefore, it is respectfully submitted that inherency, as a ground for establishing anticipation despite the fact that the recited element pertaining to formation of surface complexes

is absent from both references, is not substantiated as required by M.P.E.P. Sec. 2112, and the rejection is therefore overcome.

Conclusion

Applicants submit that claims 1 - 4 are in condition for allowance. Reconsideration and withdrawal of the rejections as to those claims are requested. Allowance of claims 1 - 4 at an early date is solicited.

Respectfully submitted,

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